

What is Claimed is:

1. A method for acidifying a food product, the method comprising contacting food product with an amount of an electrodialyzed composition effective for lowering pH of the final product to 4.6 or less, the electrodialyzed composition having a total cation concentration of 5 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH 4.5 or less.
2. The method of claim 1, wherein the food product is selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.
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3. The method of claim 1, wherein the food product is selected from the group consisting of beverages, desserts, dressings, sauces, gravies, dips, spreads, snacks, pasta, cereal and baked goods.
- 15 4. The method of claim 1, wherein the electrodialyzed composition has a total cation concentration of 0.5N or less, an individual cation concentration of 0.3N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.
- 20 5. The method of claim 4, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.
- 25 6. The method of claim 1, wherein the food product is contacted with an amount of electrodialyzed composition effective for lowering the pH of the final product to 4.2 or less.
- 30 7. A method for preparing a preserved food product, said method comprising (1) contacting a food product with an amount of electrodialyzed composition effective for obtaining an acidified food product, wherein the amount is sufficient to achieve a pH of 4.6 or less in the food product; (2) placing the acidified food product in a heat-stable, sealable container; (3) sealing the container; (4) thermally treating the food product in the sealed container at a

temperature and for a time effective to pasteurize the food product; (5) cooling the thermally treated food product to reduce the temperature to about 25°C or less to obtain the preserved food product.

5 8. The method as defined in claim 7, wherein the food product is selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

9. The method as defined in claim 7, wherein the container is a plastic pouch.

10 10. The method of claim 7, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

15 11. The method of claim 10, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less and a pH of 3.5 or less.

12. The method of claim 7, wherein the food product is contacted with an amount of electrodialyzed composition effective for achieving a pH of 4.2 or less in the food product.

20 13. A method for preparing a preserved food product, said method comprising (1) placing a food product in a sealable, heat stable container; (2) adding an amount of electrodialyzed composition to the container, wherein the amount is sufficient to achieve a pH of 4.6 or less in the preserved food product; (3) sealing the container; (4) thermally treating the food product in the sealed container at a temperature and for a time effective to pasteurize the food product; (5) cooling the thermally treated food product to rapidly reduce the temperature to 25°C or less to obtain the preserved food product.

14. The method of claim 13, wherein the food product is placed in the sealable, heat stable container is selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

5 15. The method of claim 13, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

10 16. The method of claim 15, wherein the electrodialyzed composition has a total cation concentration of 0.1 N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

15 17. The method of claim 13, wherein the amount of electrodialyzed composition added to the container is effective for achieving a pH of 4.2 or less in the preserved food product.

18. A method for preparing preserved vegetables, said method comprising (1) pretreating raw vegetables in order to reduce an initial microbiological load; (2) placing the pretreated raw vegetables in a sealable, heat stable plastic pouch; (3) adding an amount of electrodialyzed composition to the container, wherein the amount is sufficient to achieve a pH of 4.6 or less in the preserved vegetables; (4) sealing the container; (5) thermally treating the vegetables in the sealed container at a temperature and for a time effective to pasteurize the vegetables; (6) cooling the thermally treated vegetables to rapidly reduce the temperature to about 25 °C or less to obtain the preserved vegetables.

25 19. The method as defined in claim 18, wherein the vegetables are selected from the group consisting of carrots, peppers, broccoli, peas, pea-pods, cauliflower, onions, tomatoes, mushrooms, zucchini, corn, celery, asparagus, green beans, water chestnuts, and bamboo shoots.

20. The method of claim 18, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6 N or less than 0.6N, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

5 21. The method of claim 20, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

22. The method of claim 18, wherein the amount of electrodialyzed composition added to the container is effective for achieving a pH of 4.2 or less in the preserved vegetables.

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23. A method for acidifying a food product to a final product pH of less than 4.6, the method comprising contacting the food with a countercurrent stream of electrodialyzed composition having a pH of 4.5 or less and a temperature range of from 1 to 100°C for a total contact time of about 30 seconds or more, the electrodialyzed composition provided using
15 membrane electrodialysis to provide an electrodialyzed composition having a total anion or total cation concentration of 1.0N or less, an individual cation or anion concentration of 0.6N or less, and a free chlorine content of 1 ppm or less.

24. The method of claim 23, wherein the food product is selected from the group
20 consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

25. The method of claim 23, wherein the electrodialyzed composition has a total cation concentration of 0.5N or less, an individual cation concentration of 0.3N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

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26. The method of claim 25, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

27. The method of claim 23, wherein the method is effective for acidifying a food product to a final product pH of 4.2 or less.

28. A method for acidifying a formulated food product, the method comprising including
5 an amount of an electrodialyzed composition in a formulated food product by completely or partially replacing normal water in the formula effective for lowering pH to 4.6 or less, hot-filling the food product into a heat stable container or apply a heat treatment to the filled and sealed container sufficient to pasteurize the food product.

10 29. The method of claim 28, wherein the food product is selected from the group consisting of beverages, desserts, dressings, sauces, gravies, dips, spreads, snacks, pasta and cereal/ baked goods.

15 30. The method of claim 28, wherein the electrodialyzed composition having a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

20 31. The method of claim 30, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

32. The method of claim 28, wherein the amount of electrodialyzed composition in the formulated food product is effective for providing a pH of 4.2 or less.

25 33. A method for preparing preserved food products having at least one solid and one fluid component, said method comprising (1) separately pretreating either one or all components with an amount of electrodialyzed composition sufficient to achieve a pH of 4.6 or less in the final, combined, preserved food products; (2) placing the pretreated components in a sealable, heat stable container; (4) sealing the container; (5) thermally treating the sealed container at a
30 temperature and for a time effective to pasteurize the combined food products; (6) cooling the

thermally treated vegetables to reduce the temperature to about 25°C or less to obtain the preserved food products.

34. The method of claim 33, wherein all components are first placed in a sealable, heat
5 stable, heat sealable container and an amount of electrodialyzed composition is added sufficient
to achieve a pH of 4.6 or less in preserved food products.

35. The method of claims 33 and 34, wherein the solid components are selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

10 36. The method of claims 33 and 34, wherein the fluid component is selected from the group consisting of syrups, toppings, dressings, sauces, gravies, dips, spreads, and the like.

15 37. The method of claims 33 and 34, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

20 38. The method of claim 37, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

39. The method of claim 33, wherein step (5) and (6) are replaced by directly placing the treated components into the container at a temperature of the components greater than 70°C.

25 40. The method of claim 33, wherein the amount of electrodialyzed composition added is effective for providing a pH of 4.2 or less.

30 41. A method for preparing preserved pasta using an in-package process, said method comprising (1) combining dry pasta with an electrodialyzed composition having a temperature of about 70 °C or greater in a heat stable, heat sealable container, the electrodialyzed composition

effective for achieving a final, equilibrium pH of the preserved pasta of 4.6 or less; (2) sealing the filled container; (3) thermally treating the sealed container at a temperature of 70 °C or greater; (4) mixing for about 2 minutes or more, the mixing effective for providing a uniform distribution of the electrodialyzed composition in the pasta; (4) cooling the thermally treated

5 pasta to reduce the temperature to about 25 °C or less to obtain the preserved pasta.

42. The method of claim 41, wherein a ratio of dry pasta to electrodialyzed composition is 0.70 or greater.

10 43. The method of claim 41, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less than 0.6N, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

15 44. The method of claim 41, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

45. The method of claim 42, wherein the electrodialyzed composition is effective for providing a pH of 4.2 or less in the preserved pasta.

20 46. The method of claim 42, wherein a ratio of dry pasta to electrodialyzed composition is 0.80 or greater.

25 47. The method of claims 1, 7, 13, 18, 23, 28, 33 and 41, wherein the total food acidulants in preserved food products with a pH of less than 4.6 is 1 weight percent or less.

48. The method of claim 47 wherein the food acidulants include at least one food acidulant selected from the group consisting of acetic acid, adipic acid, citric acid, fumaric acid, gluconic acid, lactic acid, malic acid, tartaric acid and phosphoric acid.

49. An acidified food product prepared by a method comprising: contacting food product with an amount of an electrodialyzed composition effective for lowering pH of the final product to 4.6 or less, the electrodialyzed composition having a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a
5 pH 4.5 or less.

50. The acidified food product of claim 49, wherein the food product is selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

10 51. The acidified food product of claim 49, wherein the food product is selected from the group consisting of beverages, desserts, dressings, sauces, gravies, dips, spreads, snacks, pasta, cereal and baked goods.

15 52. The acidified food product of claim 49, wherein the electrodialyzed composition has a total cation concentration of 0.5N or less, an individual cation concentration of 0.3N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

20 53. The acidified food product of claim 52, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

54. The acidified food product of claim 49, wherein the food product is contacted with an amount of electrodialyzed composition effective for lowering the pH of the final product to 4.2 or less.

25 55. A preserved food product prepared by a method comprising (1) contacting a food product with an amount of electrodialyzed composition effective for obtaining an acidified food product, wherein the amount is sufficient to achieve a pH of 4.6 or less in the food product; (2) placing the acidified food product in a heat-stable, sealable container; (3) sealing the container;
30 (4) thermally treating the food product in the sealed container at a temperature and for a time

effective to pasteurize the food product; (5) cooling the thermally treated food product to reduce the temperature to about 25°C or less to obtain the preserved food product.

5 56. The preserved food product as defined in claim 55, wherein the food product is selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

10 57. The preserved food product as defined in claim 55, wherein the container is a plastic pouch.

15 58. The preserved food product of claim 55, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

20 59. The preserved food product of claim 58, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less and a pH of 3.5 or less.

25 60. The preserved food product of claim 55, wherein the food product is contacted with an amount of electrodialyzed composition effective for achieving a pH of 4.2 or less in the food product.

30 61. A preserved food product prepared by a method comprising (1) placing a food product in a sealable, heat stable container; (2) adding an amount of electrodialyzed composition to the container, wherein the amount is sufficient to achieve a pH of 4.6 or less in the preserved food product; (3) sealing the container; (4) thermally treating the food product in the sealed container at a temperature and for a time effective to pasteurize the food product; (5) cooling the thermally treated food product to rapidly reduce the temperature to 25°C or less to obtain the preserved food product.

62. The preserved food product of claim 61, wherein the food product is placed in the sealable, heat stable container is selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

5 63. The preserved food product of claim 61, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

10 64. The preserved food product of claim 63, wherein the electrodialyzed composition has a total cation concentration of 0.1 N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

15 65. The preserved food product of claim 61, wherein the amount of electrodialyzed composition added to the container is effective for achieving a pH of 4.2 or less in the preserved food product.

20 66. A preserved vegetable prepared by a method comprising (1) pretreating raw vegetables in order to reduce an initial microbiological load; (2) placing the pretreated raw vegetables in a sealable, heat stable plastic pouch; (3) adding an amount of electrodialyzed composition to the container, wherein the amount is sufficient to achieve a pH of 4.6 or less in the preserved vegetables; (4) sealing the container; (5) thermally treating the vegetables in the sealed container at a temperature and for a time effective to pasteurize the vegetables; (6) cooling the thermally treated vegetables to rapidly reduce the temperature to about 25°C or less to obtain the preserved vegetables.

25 67. The preserved vegetable as defined in claim 66, wherein the vegetables are selected from the group consisting of carrots, peppers, broccoli, peas, pea-pods, cauliflower, onions, tomatoes, mushrooms, zucchini, corn, celery, asparagus, green beans, water chestnuts, and bamboo shoots.

68. The preserved vegetable of claim 66, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6 N or less than 0.6N, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

5 69. The preserved vegetable of claim 68, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

10 70. The preserved vegetable of claim 66, wherein the amount of electrodialyzed composition added to the container is effective for achieving a pH of 4.2 or less in the preserved vegetables.

15 71. A preserved food products having at least one solid and one fluid components prepared by a method comprising (1) separately pretreating either one or all components with an amount of electrodialyzed composition sufficient to achieve a pH of 4.6 or less in the final, combined, preserved food products; (2) placing the pretreated components in a sealable, heat stable container; (4) sealing the container; (5) thermally treating the sealed container at a temperature and for a time effective to pasteurize the combined food products; (6) cooling the thermally treated vegetables to reduce the temperature to about 25°C or less to obtain the 20 preserved food products.

25 72. The food product of claim 71, wherein all components are first placed in a sealable, heat stable, heat sealable container and an amount of electrodialyzed composition is added sufficient to achieve a pH of 4.6 or less in preserved food products.

73. The food product of claim 71 or 72, wherein the solid components are selected from the group consisting of vegetables, beans, meat, potato, rice, pasta, and mixtures thereof.

30 74. The food product of claim 71 or 72, wherein the fluid component is selected from the group consisting of syrups, toppings, dressings, sauces, gravies, dips, spreads, and the like.

75. The food product of claim 71 or 72, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

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76. The food product of claim 71, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

10 77. The food product of claim 71, wherein step (5) and (6) are replaced by directly placing the treated components into the container at a temperature of the components greater than 70°C.

15 78. The food product of claim 71, wherein the amount of electrodialyzed composition added is effective for providing a pH of 4.2 or less.

20 79. A preserved pasta prepared using an in-package process, said method comprising (1) combining dry pasta with an electrodialyzed composition having a temperature of about 70 °C or greater in a heat stable, heat sealable container, the electrodialyzed composition effective for achieving a final, equilibrium pH of the preserved pasta of 4.6 or less; (2) sealing the filled container; (3) thermally treating the sealed container at a temperature of 70 °C or greater; (4) mixing for about 2 minutes or more, the mixing effective for providing a uniform distribution of the electrodialyzed composition in the pasta; (4) cooling the thermally treated pasta to reduce the temperature to about 25 °C or less to obtain the preserved pasta.

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80. The preserved pasta of claim 79, wherein a ratio of dry pasta to electrodialyzed composition is 0.70 or greater.

81. The preserved pasta of claim 79, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less than 0.6N, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

5 82. The preserved pasta of claim 81, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

10 83. The preserved pasta of claim 81, wherein the electrodialyzed composition is effective for providing a pH of 4.2 or less in the preserved pasta.

15 84. A formulated food product prepared by a method comprising including an amount of an electrodialyzed composition in a formulated food product by completely or partially replacing normal water in the formula effective for lowering pH to 4.6 or less, hot-filling the food product into a heat stable container or apply a heat treatment to the filled and sealed container sufficient to pasteurize the food product.

20 85. The formulated food product of claim 84, wherein the food product is selected from the group consisting of beverages, desserts, dressings, sauces, gravies, dips, spreads, snacks, pasta and cereal/ baked goods.

25 86. The formulated food product of claim 84, wherein the electrodialyzed composition has a total cation concentration of 1.0N or less, an individual cation concentration of 0.6N or less, a free chlorine content of 1 ppm or less, and a pH of 4.5 or less.

87. The formulated food product of claim 86, wherein the electrodialyzed composition has a total cation concentration of 0.1N or less, an individual cation concentration of 0.04N or less, a free chlorine content of 1 ppm or less, and a pH of 3.5 or less.

88. The formulated food product of claim 84, wherein the amount of electrodialyzed composition in the formulated food product is effective for providing a pH of 4.2 or less.

89. The food products of claim 49, 55, 61, 66, 71, 79 or 84, wherein the total food acidulants in preserved food products with a pH of less than 4.6 is 1 weight percent or less.

90. The method of claim 47 wherein the food acidulants include all approved food acidulants and at least one food acidulant selected from the group consisting of acetic acid, adipic acid, citric acid, fumaric acid, gluconic acid, lactic acid, malic acid, tartaric acid and phosphoric acid.